S
333.7917
E29es 1987-001

Montana State Library
3 0864 1004 5837 4

ENERGY SAVINGS For Nursing Homes ENERGY SAVINGS

CONRAD ECF CUTS HEATING BILLS AND IMPROVES COMFORT

Added roof insulation has paid off in terms of both energy savings and comfort for Pondera Medical Center Extended Care Facility in Conrad.

"When we replaced the roof, we decided to insulate at the same time," explained Norm Campeau. He is administrator of the Pondera Medical Center, a three-building complex that includes the ECF, a hospital, and a clinic.

"When they built the ECF in 1957, they weren't especially concerned about energy costs," Campeau explained. "We had a concrete slab roof with an inch and a half of rigid insulation covered with roofing material with a total R-value of about 5."

Little Extra Cost

"Last year when we had to replace the roof, we decided to add R-40 insulation to the roof at the same time. We bid the job both with the added insulation and without and found there wasn't a substantial difference in the cost of the job for adding the insulation. The fiberglass insulation cost was $7,725. We had to raise the roof level to make room for the 12 inches of fiberglass. That meant we had to build trusses. We put furring strips in and nailed them to the concrete deck."

After one season with the new roof, Campeau estimated the extra insulation cut the ECF's natural gas bills by 25 percent — that's about $3,000 a year. He expects the extra insulation to pay for itself in gas savings in less than three years.

"And there's been a definite improvement in the comfort level," he said. "In addition to being warmer in the winter, the ECF is cooler in the summer. The hospital building is air conditioned, but the ECF is not. Now the ECF is almost as cool as the air conditioned hospital."

Eliminates Condensation

The new insulated roof has also eliminated a condensation problem.

"We had water running down the walls and the windows constantly," Campeau said, "but the new roof seems to have eliminated that problem."

The Pondera Medical Center has a strong preventive maintenance program that helps keep the heating bills down.

"Caulking and weatherstripping is an ongoing thing with us," Campeau said. "It's just routine maintenance. We check each year to make sure the caulking and weatherstripping around each window and door is in excellent shape."

The center maintenance staff also cleans and oils all motors regularly to keep operating costs down and minimize down time.

Campeau is now looking into the possibility of using the large gas-fired boilers in the adjoining hospital to heat the ECF. The hospital has three new, efficient boilers, while the ECF home has three older boilers.

"Except on extremely cold days, we're heating the hospital with just one of the boilers; so we might have the capacity to heat both buildings with the hospital boilers. But we're doing some careful engineering studies before we go ahead and spend the money to combine the heating systems."

Free Analysis

In 1985 the medical center had an energy conservation analyst from the Montana Local Government Energy Office do a walk-through energy audit. The audit was free. Campeau said it provided invaluable background information for the center's energy savings program. (For more information on the free audits for nursing homes affiliated with Montana cities or counties, contact the Montana Local Government Energy Office, 101 East Broadway, Suite 5B, Missoula, MT 59802, phone: 721-7294; or Montana Association of Counties, 1802 Eleventh Avenue, Helena, MT 59601, phone: 442-5209.)

Norman R Campeau in front of Pondera Medical Center ECF in Conrad

TRACKING DOWN ENERGY SAVINGS

You can cut your electricity and natural gas costs by eight to sixteen percent just by keeping track of your energy use, according to Marvin Gough, former director of the American Hospital Association's Energy Task Force.

"If your utility company said they'd give you one or two months' free energy if you would just track your energy consumption, would you do it?" Gough asked the 45 people attending the Montana Health Care Association Convention in Helena in April 1987. "I guarantee you will get those kinds of savings if you just start tracking your energy consumption."

Before his talk in Helena, Gough studied two nursing homes in southwestern Montana. One, a 57-bed facility, spent $20,201 on natural gas and electricity in the year ending February 28, 1987, and $24,051 in the preceding year. The second, a 98-bed skilled-care facility, spent $28,775 in the year ending November 30, 1986.

"Saving eight to sixteen percent on those bills could quickly add up," he said.

"Energy is a non-emotional, non-controversial economy measure," Gough said, adding that you can save money on energy without decreasing the quality of patient care or decreasing patient comfort in any way. "And the savings go on year after year in many cases."

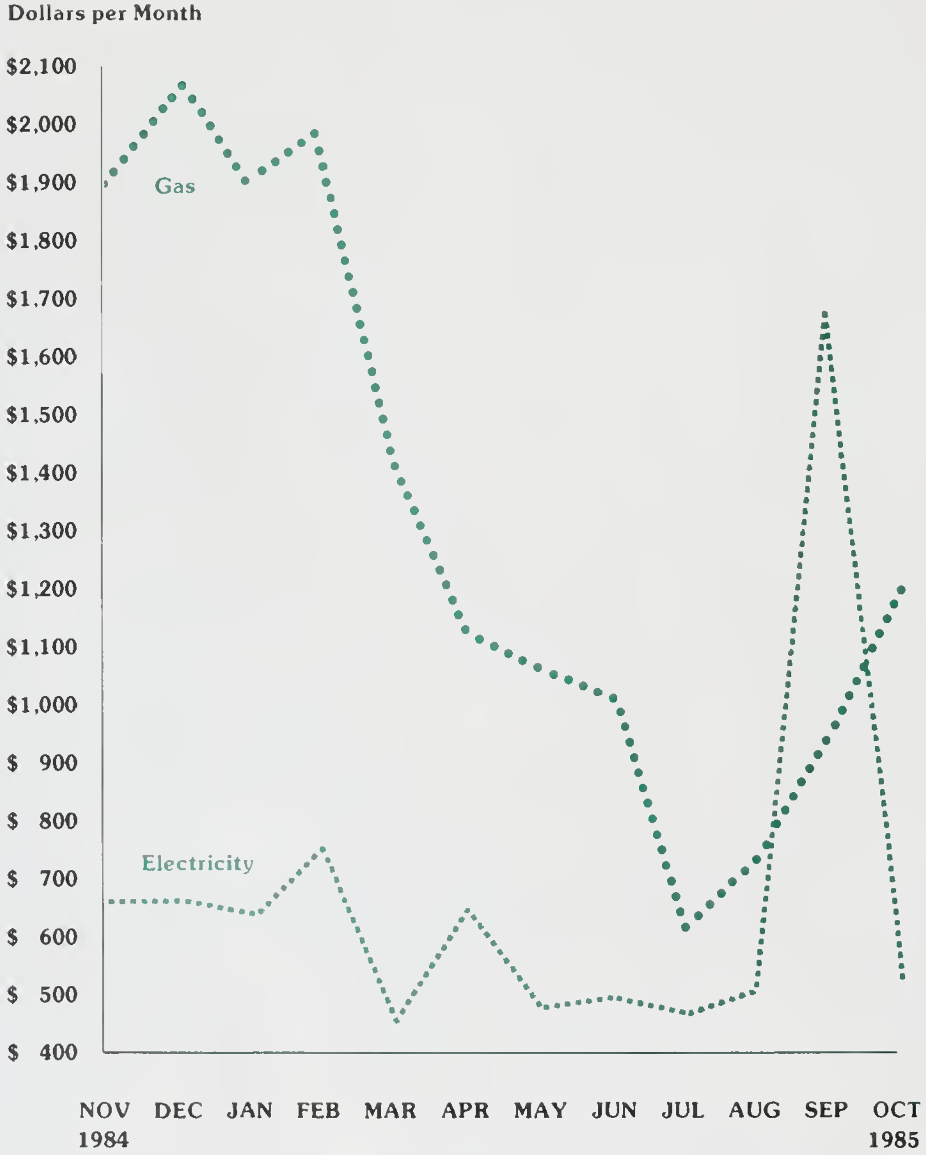


Figure 1. Energy Costs Per Month

This graph tracks the gas and electricity costs for a southwestern Montana nursing home. Finding the causes for sharp peaks like the one in electricity costs in September can lead to significant savings.

No Cost — Low Cost Savings

You can also make substantial cuts in energy costs without capital expenditures or with minimal expenditures.

Gough recommended that nursing homes start their energy conservation programs by taking the no-cost and low-cost measures first.

Take a Positive Cash Flow Approach

"Take a positive cash flow approach to undertaking energy conservation measures," he said. "Implement the no-cost measures first, track the savings, and apply the savings toward cost-effective measures that require a capital outlay."

Gough urged nursing home administrators to carefully go over their gas and electricity bills each month. "Then look at your gas and electricity bills for the past year — or even better, for the past three years — to see the month by month changes," he said. If you don't have the utility bills in your files, he added, ask your local utility for that information. Putting the information on energy consumption and costs into graphs is very helpful (see figure 1).

To factor out the severity of the weather, you can make graphs based on the amount of energy used per degree day. Most utilities keep track of the degree days in their area.

What to Look for

A very important step, Gough added, is making sure your nursing home is on the right rate schedule.

"Contact the customer service representative at your local utility and ask about your rate schedule," he said. "And ask them to explain exactly how the rate works. Some utilities add peak demand charges, charging a premium for the highest amount of electricity you use in any 15-minute period during the billing period. You can, for example, make substantial cuts in your demand charges by staggering the start-up times for equipment that uses a lot of electricity."

Marvin F. Gough

Cost Per Bed

He also urged the administrators to look at their utility bills in several different ways.

"In addition to adding up just how much you're spending per year for electricity and natural gas," he said, "take a look at how much that calculates out to per square foot of building space or per bed per year."

One of the Montana nursing homes Gough studied was spending $354.62 per bed per year for gas and electricity; the other was spending $293.62

"Compare your performance this year to last year's," he said. "But don't try to compare your performance to that of another nursing home. Each building is different. What you're looking for is a reduction in **your** energy consumption."

Gough urged administrators to work closely with their maintenance supervisors on energy conservation and to share the energy cost tracking information with them.

"This will let your maintenance supervisor know how important his contribution is to the success of your nursing home."

The tracking will lead you to the money-saving measures that will work the best for your facility, he said. Each facility is different, and knowing your facility — knowing what will work for you and what won't work — is the key to saving energy and money

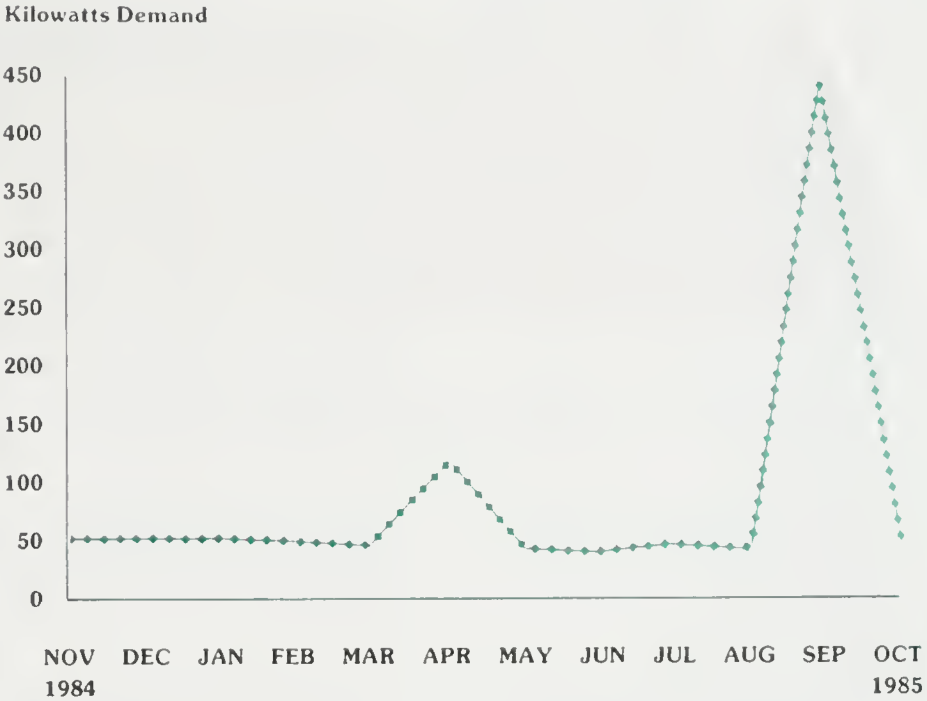


Figure 2. Electric Demand Kilowatts

The September spike in electric demand cost a southwestern Montana nursing home $1,100 on its monthly power bill. Since the spike is exactly ten times the nursing home's usual demand, it may be due to a meter reading error. Malfunctioning equipment, equipment being left on when it isn't being used, or remodeling work might also cause spikes like this.

For More Information

1. Your local utility company is an excellent source of information about energy conservation.
2. The Montana Department of Natural Resources and Conservation, 1520 East Sixth Avenue, Helena, MT 59620, offers a free booklet, "How to Reduce Energy Costs in Your Building."
3. The Montana Local Government Energy Office, 101 East Broadway, Suite 5B, Missoula, MT 59802, phone: 721-7294; and Montana Association of Counties, 1802 Eleventh Avenue, Helena, MT 59601, phone: 442-5209, offer free preliminary walk-through energy audits for nursing homes affiliated with Montana cities or counties. They also produce an operation and maintenance newsletter.
4. The Consulting Engineers Council of Montana, P.O. Box 2128, Great Falls, MT 59403, offers a free booklet, "Energy Management A Wise Investment."

Free from

DNRC

Energy Division
1520 East Sixth
Helena, Montana 59620-2301

The Montana Department of Natural Resources and Conservation printed this publication in June 1987 to help Montana nursing homes cut their energy costs. The Bonneville Power Administration provided funds for the publication.

1,000 copies of this public document were published at an estimated cost of 35¢ per copy, for a total cost of $350.00 which includes $330.00 for printing and $20.00 for distribution.

START SAVING ENERGY IN YOUR NURSING HOME

Marvin F. Gough, former director of the American Hospital Association's Energy Task Force, offers these tips for saving energy in your nursing home.

1. **Keep a record of your energy consumption.**

   Comparing this month's energy consumption to last month's and to the consumption for the same month a year ago and two years ago will show how well you're doing at saving energy. It can also alert you to problems that need attention. Some nursing homes are now using microcomputer spreadsheets to analyze their energy use. See figures 1 and 2.

2. **Have an energy audit.**

   Some utilities offer free walk-through audits. Many Montana consulting firms do in-depth audits. The auditor will help you draw up an energy strategy, including identifying which actions will give you the best return on your investment.

3. **Set up an energy committee.**

   Be sure every department is represented, not just the maintenance department. There are energy-saving opportunities in every department — nursing, the kitchen, the laundry, housekeeping, and the front office. Be sure to include residents on the committee.

4. **Hold an energy workshop for your staff and residents.**

   Just letting everyone in the nursing home know you care about energy costs will help. Your staff and residents have good ideas for saving energy. Just ask them.

5. **Set up a preventive maintenance program.**

   A formal, documented program will ensure that all equipment gets the maintenance it needs. Start with a list of all equipment that should be maintained and when it should be cleaned, lubricated, and tuned. Record the date of maintenance done on each piece of equipment. Properly maintained equipment uses less energy than poorly maintained equipment. Regular preventive maintenance can also keep repair costs low, minimize equipment down time, and extend the life of your equipment. Be sure to file the operating instructions and service manuals for all your equipment.

6. **Turn it off.**

   Turn off equipment when it's not in use. Keep the exhaust hoods over the stoves in the kitchen off whenever you aren't actually cooking under them. If you run the average exhaust hood all the time, it would draw out enough energy to provide heating for four resident rooms or cooling for eight resident rooms.

7. **Make energy saving standard practice.**

   Include energy saving steps in your standard operating procedures and put them in writing. Make turning down the lights at night or shutting off the kitchen exhaust hoods after supper standard procedure.

8. **Build energy savings in when you remodel, add on, or buy equipment.**

   When you're replacing your roof, consider adding some more insulation. If you're adding on, ask your architect, engineer, building designer, and contractor to incorporate energy-saving measures right into the building, like energy-efficient fluorescent lights and ballasts. While the initial cost of some energy-efficient equipment may be higher than the initial cost of less efficient equipment, the total cost of buying, running, and maintaining the more efficient equipment over its lifetime is often significantly lower. Check energy use when selecting motors, lights, and refrigerators.

9. **Avoid the piecemeal approach.**

   For example, insulate your ceilings and walls before replacing your boiler. You will need a smaller capacity — less expensive — boiler after you've reduced your heating load.

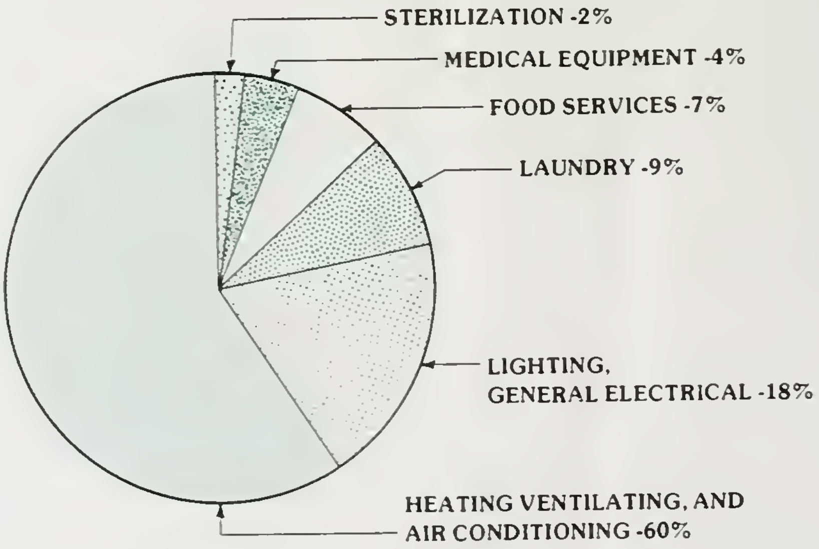
10. **Develop your maintenance staff.**

    A maintenance staff that fully understands your heating, ventilating, and air conditioning system and all your other equipment is invaluable in your cost containment efforts. Invest in them by getting them training, like that offered at DNRC's workshops for building operators. That small training investment will pay off in big cost savings.

11. **Consider the cost of delay.**

    The cost of delaying, especially on the low-cost and no-cost energy saving measures like weatherstripping on doors, could add up to ten percent of your total utility costs. Those are dollars that you could be using for patient care.

Typical Nursing Home Energy Use



Reprinted with permission from "Nursing Homes Technical Report" by the Colorado Energy Conservation and Alternatives Center for Commerce and Industry, August 1978.

S
333.7917
E29en
~~Butte~~ c.1
987-00

Montana State Library
3 0864 1004 5824 2

NERGY SAVINGS
Hospitals
ENERGY SAVINGS

BUTTE HOSPITAL CUTS HEATING COSTS BY A THIRD

St. James Community Hospital in Butte has reduced its heating bills by nearly $70,000, according to the hospital's vice president. The savings come from nine energy saving measures the hospital installed in 1982. The measures include storm windows and heat reclamation units on the ventilating and domestic hot water systems.

"It's reduced our natural gas costs by a third," said Joe Harstead, vice president of St. James. "That's money that can be used elsewhere in the hospital for so many things, like equipment for the Cancer Treatment Center we just completed."

Grants Help

St. James officials first got interested in energy conservation in the 1970s when energy costs rose rapidly. The first step was to do an energy audit. By 1980 the hospital had done about everything it could do to save energy on its own. The hospital then got a $10,620 grant under the federally-funded Institutional Conservation Program (ICP), which is administered by the Montana Department of Natural Resources and Conservation. The grant paid half the cost of hiring an engineering firm to go over all the hospital's energy systems. The firm came up with a list of 14 energy conservation measures that would pay for themselves in energy savings in 15 years or less.

The hospital decided to implement nine of the measures, which are expected to pay for themselves in less than eight years.

"Getting the grant was relatively easy," Harstead said, adding that he'd checked carefully before accepting the grant to make sure there were no strings attached.

Another ICP grant paid $244,160 of the $508,644 cost of installing the measures.

"It really made good sense even without the grant," Harstead said. "But without the grant, we would have phased the measures in over a long period of time so we would have lost some of the really substantial savings we are getting now."

Gas Use Drops 38 Percent

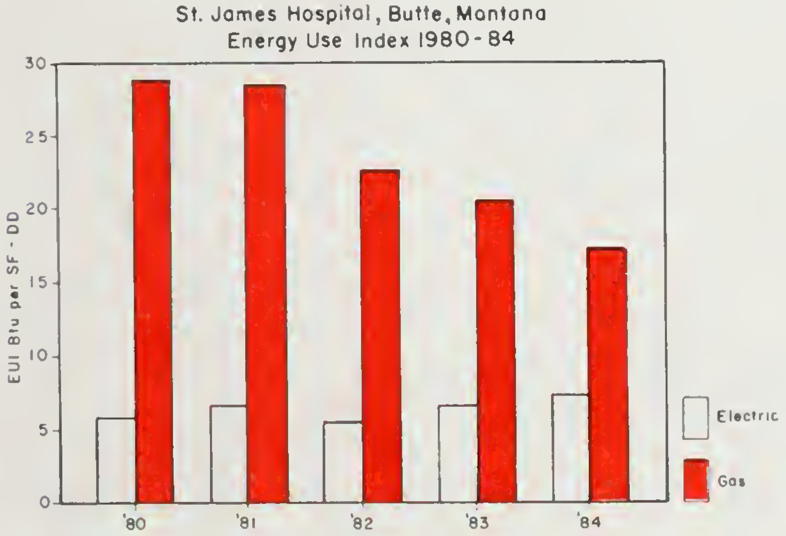
The hospital's annual natural gas use dropped 38 percent after the measures were installed. In 1985 and 1986 the hospital's bills increased again due to construction of the Cancer Treatment Center.

Heat Reclamation System

The energy conservation program included adding a heat reclamation system to the hospital's ventilating system. Warm inside air has to be exhausted continuously from the building and cold outside air brought in to make up for it. Normally the exhausted heat is simply lost, and the make up air has to be heated by the steam system. With a heat reclamation system, both air streams pass through heat exchangers. Heat is extracted from the outgoing air and used to warm the incoming air. There is no mixing of the incoming and outgoing air.

Only "good, clean air" goes through the heat reclamation system, Harstead said, adding that air from areas like bathrooms is exhausted directly outside.

"At first I was skeptical of the system," said Director of Engineering Phil Martinez, who has been with St. James 28 years. "But the change in air temperature convinced me. The temperature of the incoming air increases 20 to 30 degrees when it goes across the heat exchanger. And that's all from heat we were just exhausting."



This graph shows the 31 percent decrease in natural gas consumption at St. James Hospital after energy conservation measures were installed in 1982 and 1983. To factor out differences in the severity of winters, the figures are given in British thermal units per square foot per heating degree day. The slight increases in electrical use in 1983 and 1984 shown on the graph are apparently due to new equipment being installed at the hospital.

St. James Hospital (continued from page 1)

Laundry Yields Heat

The hospital uses another heat exchanger to reclaim heat from the gray water that runs out of the washing machines in the laundry.

Martinez said the heat exchanger extracts enough heat from the gray water to warm the incoming clean water about 30 degrees.

The nine energy-saving measures decreased the demand for steam so much the hospital was able to shut down two high pressure boilers. A single low pressure boiler now supplies all the hospital's steam needs. A second low pressure boiler is used for standby purposes only.

"All last winter, we used only one boiler," Martinez said. "Before, we had two boilers going all the time."

The high pressure steam required for sterilization is now provided by a small, electrically-heated high pressure boiler. Despite the greater cost of electricity per unit of steam produced, very little high pressure steam is needed, and operating the small electric boiler is much cheaper than running the large gas boiler for sterilization.

By installing the electric boiler close to the sterilization area, Harstead said the hospital also cut the amount of heat that would be lost by piping the steam all the way up from the old boiler in the basement.

The hospital maintained flexibility when it shut down the high pressure boilers, Martinez explained, adding that they left all the pipes in place.

"When we made all these changes," he said, "we left ourselves a way to switch back in case the fuel situation changes. All we would have to do is adjust some valves."

The energy conservation measures also included adding storm windows, replacing the incandescent lobby lights with fluorescent lamps, and adding a temperature setback control for a section of the hospital that isn't used at night.

Avoided Costs

Besides saving the hospital money on its energy bills, the conservation measures also saved construction costs when the Cancer Treatment Center was added.

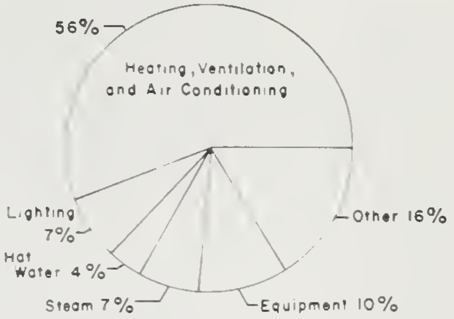
If the hospital hadn't taken the conservation measures, Harstead said, "We would have had to buy additional heating equipment to handle the Cancer Treatment Center, and the cost of that equipment would have been substantial."

Perhaps even more important is the fact that the energy conservation measures have made the building more comfortable.

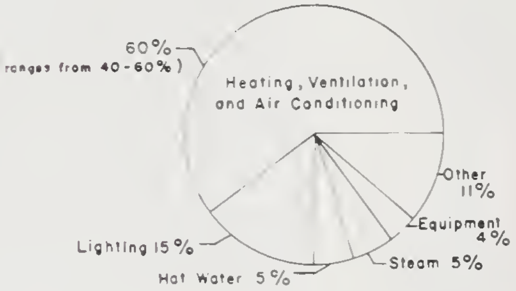
"We can't just go in and set a standard temperature like you might in an office building," Harstead said. "We let the nurses determine the temperature because they're the ones who deal with the patients."

"Patient comfort is what controls us," Martinez added.

How Energy is Used
at St. James Hospital



Hospital National Average



Source American Hospital Association

FOR MORE INFORMATION

1. Your local utility company is an excellent source of information about energy conservation.
2. The Montana Department of Natural Resources and Conservation, 1520 East 6th Avenue, Helena, MT 59620, offers a free booklet, "How to Reduce Energy Costs in Your Building."
3. Several Energy Conservation publications for hospitals are available by writing: Blue Cross and Blue Shield Association, ATTN: Energy Project Publications, 676 North St. Clair, Chicago, Illinois 60611.
4. The Montana Local Government Energy Office, 301 West Alder, Missoula, MT 59802, offers free preliminary walk-through energy audits and recommendations for institutions in Western Montana as well as a quarterly operation and maintenance news letter available statewide.
5. The Consulting Engineers Council of Montana, P.O. Box 2128, Great Falls, MT 59403, offers a free booklet, "Energy Management: A Wise Investment?"
6. Videotapes of presentations used to train hospital employees in energy conservation are available from Montana State Hospital, Warm Springs, MT 59756.
7. The American Hospital Association
   840 North Lakeshore Drive
   Chicago, IL 60611
   has a series of publications on energy management
8. The Montana Society of Hospital Engineers
   P.O. Box 5119
   Helena, MT 59604
9. Publications with up-to-date energy technology information for all types of institutions include:

   The Energy User News
   P.O. Box 1539
   Neptune, NJ 07754-1539

   Building Operating Management
   P.O. Box 1983
   Clinton, IA 52735

   Engineered Systems
   Business News Publishing Company
   P.O. Box 7016
   Troy, MI 48007

   Engineers Digest
   2500 Office Center
   Willow Grove, PA 19090

EMPLOYEES LEAD THE WAY TO ENERGY SAVINGS

When the energy bill went over $1 million in 1983, the superintendent of the Montana State Hospital at Warm Springs arranged for a team to tour the facilities to find out what could be done to save energy.

"We found that instead of turning off the heat, people were opening windows. We were heating spaces that were being used infrequently," said Thomas D. McCarthy, the environmental services director. Another problem encountered was in the gym at Galen, which was heated to 70 degrees even though it was used infrequently.

The team that toured the facilities became the energy committee and was made up of representatives of the various hospital departments. Members include Tom McCarthy, Jim Haus, Jerry Musick, Woody Casey, Jane Edwards, RN, Cleo Strickland, RN, Jim Barkley, Bev Murray, Sue Beausoleil and Lolly Conwell. They tackled the task of discovering what could be done to save energy.

First they recommended consolidation, which when carried out allowed the closure of several buildings and the top two floors of another building. People were persuaded to move the from staff houses that were inefficient into more energy-efficient houses.

The Montana State Hospital won a 1986 Montana Award for Energy Innovation. Presented by Gov. Ted Schwinden, the award cited the energy conservation program for reducing the hospital's operating costs by more than a quarter million dollars a year.

Employees Participate

Then they set about getting employees involved in the effort. Checklists of practices the employees could use to conserve energy were drafted and distributed. They set aside one month as "Hospital Energy Conservation Month." The hospital's In-service Education Department helped arrange seminars and films on energy conservation in the workplace and at home.

"We tried to gear the program so there was something in it for them, not just something for the hospital. We tried to show them how to stretch their pay check by saving energy at home as well as at the hospital," McCarthy said.

The committee also ran a contest to find the three best employee suggestions for saving energy at the hospital. One afternoon was set aside to review the suggestions submitted by employees and to select the winners. Amid spirited competition, the committee selected the winning suggestions.

The first place prize, a $25 gift certificate, went to Ray McMillan for suggesting installation of fiberglass batts to insulate the hospital's suspended ceilings. The second place prize, a $15 Weis fruit basket, went to Ray Lappin for his idea to use photoelectric cells to prevent outside lights from being left on during the day. Third prize, a ceramic pumpkin, went to Judy Gustafson for suggesting the installation of fluorescent lights in place of less efficient incandescent lights in a solarium. Taking fourth place was a suggestion to allow the Alcohol Service Center and the Lighthouse Program patients to monitor the energy wasted. Receiving honorable mention was a recommendation to install storm doors and to weatherstrip outside doors on several buildings.

The total cost for the energy conservation seminars, films, and contest was $600.

Experts Walk-Through

The committee also drew on the expertise and experience of energy experts outside the institution. Invitations and requests for participation in a walk-through audit were sent to various federal, state, and private agencies with energy conservation expertise. Local newspaper and television reporters were invited along on the walk-through audit as well.

On May 2, 1985, 11 energy experts did an energy walk-through of the Montana State Hospital campuses at Warm Springs and Galen. Most of the resulting ideas were low- or no-cost items that could be easily implemented. The cost to the hospital for the energy walk-through was the price of lunch for each of the experts who participated. Discovering that the building was too warm in some rooms and too cold in others, the energy experts suggested more thermostats and heat controls be installed. Among other things, the auditors saw that some double hung windows had slipped open without being noticed behind curtains and shades. They suggested not only closing the windows but caulking them as well.

Energy Costs Drop

Although the exact energy savings the program generated are difficult to measure, the hospital has shown a steady decline in both the amount and the cost of utilities since the inception of the energy conservation committee in August 1983. Hospital records show energy savings of $176,853 for fiscal year 1984, $281,483 for fiscal year 1985 and $320,070 for fiscal year 1986. A significant portion of those savings arose from implementation of employee suggestions.

Some of the measures that have been implemented include:

— Street light conversion from 300 watt incandescent to 150 watt high pressure sodium.

— An air curtain over the food delivery door.

— Photoelectric cells.

— New power burner for the boiler (resulting in a 25% savings).

Measures planned for the future include:

— Insulation.

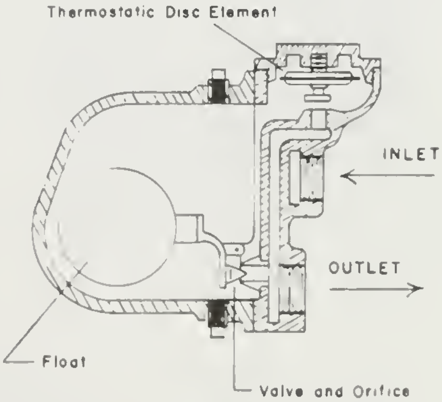
— Window repairs.

— Heat controls for each room.

— Preventive maintenance program for steam traps.

The last measure listed will require the reassignment of a maintenance plumber to clean the steam traps. A plumber working full time on cleaning the steam traps would be paying his own salary with the resulting energy savings.

Implementation of energy-saving ideas continues as time and money allow. To continue increasing employee interest in energy conservation, the committee is now planning another energy month. It will be caulked full of seminars and films on energy conservation for both the workplace and the home.



Typical Steam Trap

Reprinted by permission from ASHRAE Handbook — 1984 Systems

EIGHT STEPS TO ENERGY SAVINGS IN YOUR HOSPITAL

1. Organize an Energy Management Committee.

The committee should have representation from administration, maintenance, and each division of the hospital staff to ensure total cooperation. Energy-saving opportunities exist in all areas of operation. Engineering and maintenance personnel are the focal point of energy information because they operate and maintain the major energy-intensive systems in the hospital. An implementation team should also be organized and centered within the engineering and maintenance department to work with the energy management committee.

2. Set Up A Preventive Maintenance Program.

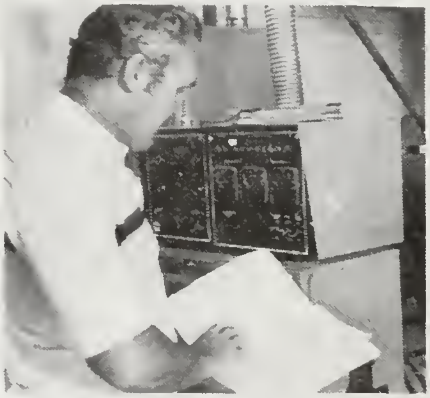
A formal, documented program will ensure that all equipment gets the maintenance it needs on time. A formal preventive maintenance program starts with a list of all equipment that should be maintained and when it should be cleaned, lubricated, and tuned. Record the date of maintenance done on each piece of equipment. Properly maintained equipment works more efficiently and uses as much as 20 percent less energy than poorly maintained equipment. Regular preventive maintenance can also keep repair costs low, minimize equipment malfunctions, and extend the life of your equipment.

3. Write an Operations Manual.

Just a single page for each piece of equipment in your operation may be enough. It should explain exactly how to operate and maintain the equipment. An operations manual is especially helpful when you have changes in personnel.

4. Have an Energy Audit.

An energy audit is an analysis of how your building uses energy. The audit report usually lists no-cost and low-cost steps you can take to cut your energy bills. The auditor will help you draw up an energy strategy, including identifying which actions will give you the best return on your investment. A more in-depth technical analysis would be advisable if you are doing extensive remodeling, buying expensive equipment, putting on an addition, or are planning to participate in conservation grant programs offered through the Montana Department of Natural Resources and Conservation (DNRC). Lists of professionals that do energy audits and technical analyses are available through DNRC.



Woodrow Casey, maintenance supervisor at Galen, checks the operations manual for a boiler

5. Keep a Record of Your Energy Consumption.

Hospital engineers should read gas, electricity, and water meters on the first of each month or make arrangements to receive all consumption information from utility bills. Monthly comparisons of energy consumption provide a basis for evaluating the success of the program and indicate any significant changes in energy use that may require corrective action. Many facilities find it easy and useful to enter data on a microcomputer spreadsheet for analysis.

6. Hold an Energy Workshop for All Your Employees.

Employee cooperation and participation are essential to a successful energy management program. Establish a formal program to instruct employees in the simple, day-to-day things that save energy. The energy management committee may want to consider the services of qualified consultants. A means should be established to encourage the submittal of energy-saving ideas and recognition should be given to individuals who submit those ideas. Notices on bulletin boards, posters, and staff meetings help maintain the awareness and enthusiasm needed for an effective energy management program.

7. Consider Energy Usage When Purchasing New Equipment.

Initial cost of some energy-efficient equipment, such as motors, lights, and refrigeration, may be greater than the initial cost of less efficient equipment. Select new equipment on the basis of the total cost of buying, running, and maintaining it over its expected life rather than on the basis of initial cost only.

8. Consider An Automated Energy Management System.

Automated energy management can often produce significant savings in buildings with large, complex, intermittent loads. Such a system can be used to control several areas such as those with different heating, ventilating, and air conditioning requirements, supplying only what is needed by each area. Other features include night set-back for chillers and areas that do not operate on a 24-hour basis, night flush to use outside air to cool areas with excessive daytime heat gains, load scheduling to avoid electrical demand charges, and a 365-day time clock to control interior and exterior lighting and operate seasonal equipment.

---

free from

DNRC
Energy Division
Capitol Station
Helena, MT 59620-2301

1,000 copies of this document were published at an estimated cost of 34¢ per copy for a total cost of $340.00, which includes $340.00 for printing and $.00 for distribution.

This publication was funded by Bonneville Power Administration.

S
333.7917
29es
~~[illegible]~~
C-1
81-003

Montana State Library
3 0864 1004 5823 4

NERGY SAVINGS

Energy Savings

ENERGY SAVINGS

GREAT FALLS DAIRY QUEEN BUILDS IN ENERGY SAVINGS

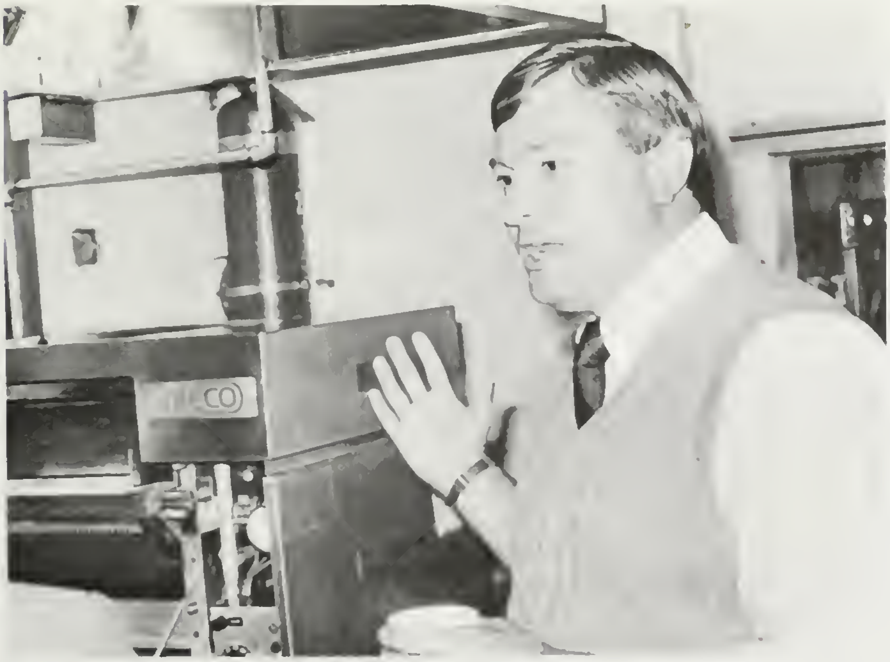
Energy savings can only come from constant vigilance, according to the owner of three Great Falls Dairy Queen stores.

"You can't just go through your place once, make a big change, and figure you've got it licked," said Curt Langendorff. "As soon as you turn around, something new comes along. Most of your energy losses result from lethargy—becoming accustomed to doing things in a certain way, or not keeping up with the technology. Energy conservation has got to be an on-going process."

Just ten years ago, he said, restaurant operators didn't pay much attention to their energy bills.

"Energy costs were almost incidental then—just a minor expense you took care of without thinking," Langendorff said. "But by 1980 energy costs were one of the major expense items on our profit and loss statement. This forced us to take a hard look at what we could do to reduce our energy costs."

Many energy-saving measures were built into the Tenth Avenue South Dairy Queen, including smaller windows.



Curt Langendorff doesn't fire up the chain broiler until 11 a.m. most days; he cooks on the modular flat grill during slow periods at the Tenth Avenue South Dairy Queen.

Built-In Energy Savers

About the same time Langendorff remodeled the Northside Dairy Queen on Second Avenue North.

"We tried to build in as much energy conservation as we could," he said.

The building is divided so the temperature in different parts of the building can be varied to suit the use of the rooms.

"Because of the high turnover in help, we tried to make all the thermostats and the other energy-saving measures as automatic as possible, so we don't have to depend on someone remembering to turn the thermostat down when they leave to get our savings," Langendorff said.

free from
MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
DNRC
Energy Division
Capitol Station
Helena, MT 59620

Direct Makeup Air

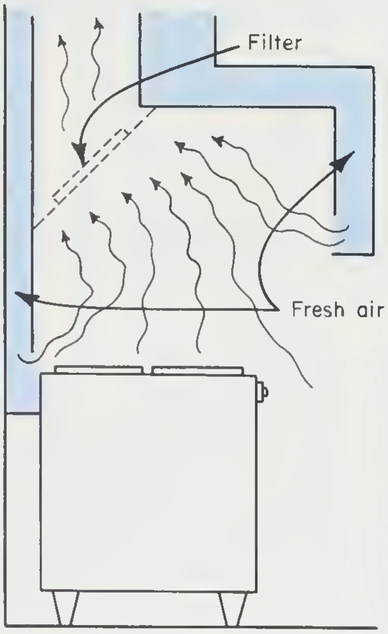
When Langendorff built a new store on Tenth Avenue South in 1983, he incorporated even more energy conservation measures.

The modern exhaust hoods in the kitchen are particularly effective energy savers, he added.

Located over the grills and fryers, the hoods pull the heat, grease vapors, and by-products of natural gas combustion out of the kitchen. Langendorff's new hoods eliminate the need for an air treatment system in the kitchen.

"The untreated air comes in at the hood level and goes right back out the hood," he explained. "In the past you needed an air treatment system for the kitchen to keep the air in the store in balance. Usually you had gas-fired burners up on the roof to heat all that air in the winter and swamp coolers to cool the air in the summer. It was expensive to heat all that air in the winter; but if you didn't have the air treatment system for the kitchen, the exhaust fans drew the air from the rest of the building, like your seating area, and that was even more expensive."

Hood Exhausting Contaminated Air



Reprinted from Greencheck Fan Corporation, Cooking Equipment Ventilation: Application and Design (Schofield, Wis.: Greencheck Fan Corporation, 1981), p.3.

Cooling Blinds

Langendorff also took steps to save energy at his Fox Farm Road store.

He covered the large south- and west-facing windows with miniblinds backed with a reflective material. The blinds bounce the summer heat back out of the building.

"We've noticed a substantial improvement in our ability to cool the building. We're not running the air conditioner as much as we did before we installed the blinds," he said, adding that covering the windows also helps to keep the store warmer in the winter.

Langendorff said he cut his cooking costs two-thirds by replacing a 15-year-old charcoal broiler with a new flat grill.

The charbroiler was designed to produce 300 hamburgers an hour, because the store needed the broiler's large capacity during the noon rush. "But at 2:30 in the afternoon," he explained, "we had to fire up the entire 300-burger broiler to cook a single hamburger.

"The flat grill is divided into sections. You just turn on as many sections as you need. And the heating time is less. That old charbroiler took 15 minutes to heat up. With the flat grill, you're ready to start cooking in five minutes."

Before he bought the flat grill, Langendorff looked into other kinds of cooking. He picked the new system based on life cycle costing—the total cost of buying the equipment, operating it, and maintaining it over its expected life.

He said he plans to continue looking for ways to save energy in his restaurants.

"The things I've done are paying good dividends," Langendorff said. "So I know it's worth the effort to pay attention to energy costs and look for things we can do to save."

Beck Fields uses a quarter of the flat grill to cook a hamburger at the Northside Dairy Queen.

ENERGY-SAVING TIPS FROM OTHER MONTANA RETAURANTEURS

Other Montana restaurant operators shared techniques they've found save energy.

Roger Anderson, owner of Robbie's in the Holiday Village Mall in Great Falls, took out half of the 100 high-hat incandescent light bulbs in his dining room. "It cut our electricity bills and added a little more atmosphere," he said.

Anderson replaced an old exhaust hood with one that provides forced makeup air, like the one in the Tenth Avenue Dairy Queen. "Our furnace and air conditioner run more efficiently than before," he said. Robbie's also now has a programmable thermostat that automatically lowers the restaurant temperature after closing time at night and turns the temperature back up in the morning.

"If I do another restaurant, energy conservation will be a major consideration," he concluded.

Gary Muralt of Muralt's Truck Plaza in Missoula said he'd installed a sun protection film on the window of his restaurant to help keep the building cool in the summer. At about the same time he put in a new heavily insulated water heater. "Our energy use did go down," he said. "We added onto our facility and still are using less energy than we did before."

HOW TO START SAVING ENERGY IN YOUR RESTAURANT

Robert E. Aulbach, energy consultant for Ramada Inns and Hilton Hotels, offered these ten tips for saving energy in your restaurant.

1. **Set up an energy committee.**

   Be sure all workers are represented, not just those in maintenance. There are energy-saving opportunities for food servers, dishwashers, cooks, and cashiers.

2. **Write an operations manual.**

   Just a single page for each piece of equipment in your operation is enough. It should explain exactly how to operate and maintain the equipment. The operations manual is especially helpful when you have changes in personnel.

3. **Have an energy audit.**

   An energy audit is an analysis of how your restaurant uses energy. In addition to studying your utility bills, the auditor will "walk through" your operation, identifying energy conservation opportunities. The audit report usually lists no-cost and low-cost steps you can take to cut your energy bills. The report may also include information about expenditures and their payback period—the amount of time it will take for your energy savings to offset the expenditure. A more in-depth technical analysis would be advisable if you are doing extensive remodeling, buying expensive equipment, putting on an addition, or building a new restaurant. Many Montana consulting firms do energy audits and technical analyses. The For More Information sections lists some of the professional groups that do energy audits.

4. **Keep a record of your energy consumption.**

   Learn to read your gas, electricity, and water meters. Read them on the first of the month so you can compare your energy use with your sales data. Your utility representative can explain your bill and show you how to read your meter.

5. **Hold an energy workshop for all your employees.**

   Just letting everyone know you care about energy conservation will help. Your staff has plenty of good ideas for saving energy; just ask them.

6. **Set up a preventive maintenance program.**

   A formal, documented program will ensure that all equipment gets the maintenance it needs. A formal preventive maintenance program starts with a list of all equipment that should be maintained and when it should be cleaned, lubricated, and tuned. Record the date of maintenance done on each piece of equipment. Properly maintained equipment works more efficiently and uses as much as 20 percent less energy than poorly maintained equipment. Regular preventive maintenance can also keep repair costs low, minimize the time equipment malfunctions, and extend the life of your equipment.

7. **Turn it off.**

   Turn equipment off when it's not in use. The air-handling equipment in meeting rooms, for example, can be turned down or off when the rooms are empty.

8. **Set objectives.**

   Have a set of reasonable objectives for energy conservation, and let everyone in the restaurant, including your customers, know what those objectives are.

9. **Use life-cycle costing.**

   Select new equipment on the basis of the total cost of buying, operating, and maintaining the equipment over its expected life rather than making the choice on the basis of initial cost only.

10. **Understand the variables that affect energy consumption.**

    For example, when you turn off an air supply fan, turn off the accompanying exhaust fan to keep the building in balance.

FOR MORE INFORMATION

- Your local utility company is an excellent source of information about energy conservation.
- The Montana Department of Natural Resources and Conservation, 32 South Ewing, Helena, MT 59620, offers two free booklets, "How to Reduce Energy Costs in Your Building" and "Energy Management."
- The Montana Restaurant Association, 2001 Eleventh Avenue, Helena, MT 59601, frequently includes energy-saving tips in its newsletter.
- The National Restaurant Association (NRA), 311 First Street NW, Washington, D.C., 20001, offers several energy conservation publications. NRA's publications include: "Energy Management System Portfolio," "Utility Billings and Energy Surveys," "Equipment Maintenance Programs for Foodservice Operators," and "Energy Conservation Program."
- Restaurants and Institutions magazine, Cahners Plaza, 1350 Touhy Avenue, Des Plaines, Illinois, 60018, has a regular column on energy-saving techniques. Subscriptions are $24 per year.
- The Consulting Engineers Council of Montana, P.O. Box 2128, Great Falls, MT 59403, offers a free booklet, "Energy Management: A Wise Investment?"
- "Energy Management," Robert E. Aulbach's 238-page book, includes information on restaurants. It is available for $38.45 from the Educational Institute of the American Hotel and Motel Association, 1407 South Harrison Rd., East Lansing, MI 48823.
- "Working with Consultants" is available for $4.00 from the Montana Department of Commerce, Community Development Division, Capitol Station, Helena, MT 59620. This 1984 publication offers advice on finding, selecting, hiring, and monitoring the work of consultants.
- American Institute of Architects, 1629 Avenue D, Box 20996, Billings, MT 59104.
- Montana Contractors Association, Inc., 1717 Eleventh Avenue, Box 4519, Helena, MT 59601.
- Montana Society of Engineers, 1629 Avenue D, Box 20996, Billings, MT 59104.
- National Electrical Contractor Association, 2030 Eleventh Avenue, Helena, MT 59601.
- Sheet Metal Contractors Association, 2030 Eleventh Avenue, Box 1249, Helena, MT 59601.

Black Angus Conservation Effort Saves $1.5 Million

"Restaurant operators who don't take conservation seriously or who are lulled into a false sense of security by the 'oil glut' are likely to find their bottom lines strangled by the utility companies," says Steve Craig, energy/facilities maintenance manager for Saga chain, Stuart Anderson's Black Angus Restaurants.

In 1979, Craig, who was then senior internal auditor for Saga, was given the job of developing a conservation program for Black Angus. "I didn't know a kilowatt-hour from a therm," he says. "All I knew about energy was to turn my calculator off when I was done with it."

Craig learned fast. The conservation program established in June of 1980, had as its mandate to reduce energy consumption significantly without compromising productivity, comfort or security.

He began by conducting energy audits on each of the chain's 73 restaurants. "There was a lot of waste out there," he says. The next step was to design an energy accounting system to track each store's consumption, and to develop highly specific "energy action plans" for each store.

"We set up a program that works for most of our locations," says Craig. "We can adjust it to account for special high-energy locations like Phoenix or Anchorage."

First Year Savings

Craig's first-year goal was to reduce the company's energy usage by 10%; his strategy, to build employee awareness.

All managers and trainees went through energy management workshops. An energy management newsletter, "Save Your Juice Journal," was distributed bimonthly. Energy posters and decals for light switches, walk-in cooler doors, and cooking equipment reminded staff members of the goal.

Plaques were awarded to strores that achieved a 10% decrease. "Not many made it," says Craig. During fiscal 1980-81, consumption decreased only 5.1% systemwide for a dollar savings of $170,510.

Second Year Savings

"It was clear that awareness alone wouldn't do the job," says Caig. "We saw that we would need hardware to do this thing right." On the strength of the first year's results, the company gave Craig the go-ahead to invest in energy management equipment.

At the heart of the "hardware" are the firm's computers installed in 46 units, that program energy loads for everything from exhaust fans to outdoor lights and water heaters. From his central computer, Craig can "interrogate" any unit in the chain and gain access to up-to-the-minute consumption information.

Heat recovery units were installed in 21 stores to use waste heat generated from air conditioning and refrigeration compressors to produce "free" hot water. High-temperature dishwashers were replaced by low-temp units.

The results were much more satisfying. In fiscal 1981-82, consumption declined 9.7% for a savings of $334,500.

Third Year Savings

In fiscal 1982-83, the strategy was expanded to include maintenance. "This year, we have left the rest of the industry behind," Craig says. "I can't overemphasize the importance of adequate maintenance. It's what makes an energy management system work. It's the follow-through that makes the difference."

"We went for broke and invested in eight-channel energy control computers that handle heating, ventilating, air conditioning, lighting, food equipment and kitchen space heating," Craig reports. So far in year three, consumption has gone down a whopping 21.3% for a forecasted savings of $852,500.

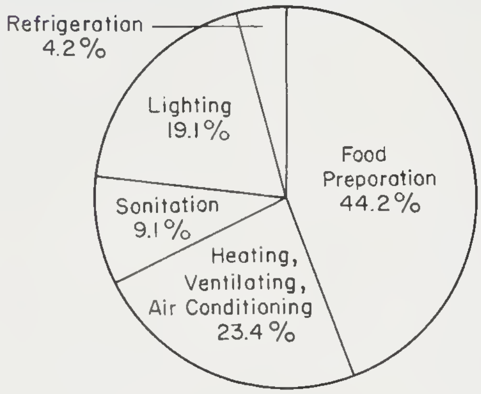
With the full program implemented in all units (awareness, maintenance and complete fine-tuned hardware), Craig projects that energy consumption will decrease 27.5% for a total savings of $1.2 million in fiscal 1983-84.

According to Craig, overall energy usage for the restaurants has decreased 24% since the program started. Total cost has been $1.5 million. The payback period has been only 361.2 days, he reports.

Because of the success of the Black Angus program, Craig says, Saga's other divisions will implement similar energy conservation programs in the future.

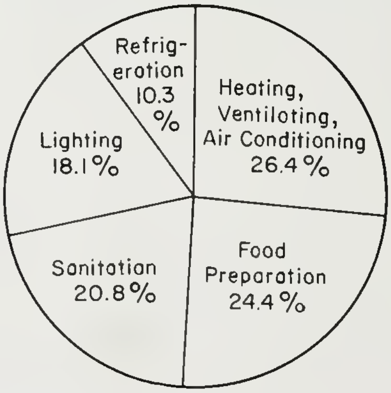
Reprinted with permission from Restaurants & Institutions, April 25, 1984, p. 192.

How Energy Is Used in a Fast Food Restaurant



From the Project on Restaurant Energy Performance, May 1985. Prepared for the U.S. Department of Energy by Pacific Northwest Laboratories, Penn State University and the National Restaurant Association.

How Energy Is Used in a Steak House



3,000 copies of this public document were published at an estimated cost of $.12 per copy, for a total cost of $360.00, which includes $360.00 for printing and $.00 for distribution.

This publication was funded by the Bonneville Power Administration.

333.7917
E29eo
Kalispell motel
c-1
87-609

Montana State Library
3 0864 1004 5822 6

ENERGY SAVINGS Energy Savings ENERGY SAVINGS

ENERGY AUDIT PAYS OFF FOR KALISPELL MOTEL

Jim Meyers opens the valve that brings the third water heater on line for the guest rooms.

KALISPELL—Saving $400 on his energy bills convinced motel owner Jim Meyers that energy audits pay off.

As a result of an energy audit, Meyers installed a separate water heater for the laundry at his 60-room Thrifty Scot Motel. The laundry needs 160-degree water, while the guest rooms need only 120-degree water. Before the audit, all the domestic water in the motel was heated to the 160 degrees needed by the laundry. The additional water heater lets Meyers turn the temperature down to 120 degrees on the two water heaters that serve the guest rooms.

The new water heater saved $398.17 in natural gas in the first three months after it was installed, he said. Since it cost $2,041.65, Meyers figures the new water heater will pay for itself in 15 months. After that, he added, the savings will be "pure profit."

"If I can make a savings like that in my small property, imagine what larger operators can do," Meyers said.

IMPROVED GUEST COMFORT

The new water heater improved guest comfort too, he said. The 75-gallon tank loops into the rest of the domestic hot water system to back up the two other water heaters.

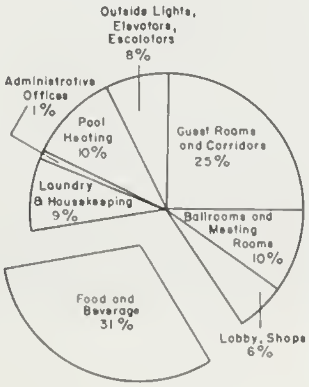
"Now when we have a large tour group and everyone is showering at once," he said, "we just turn the valve and the third water heater comes on, giving us plenty of hot water."

BUILT-IN ENERGY SAVINGS

Built in 1977, the Kalispell Thrifty Scot incorporates several energy-conserving features, including:

- Double-glazed windows throughout.
- A heat exchanger in the air-handling system for the spa area.
- Covers for the swimming pool and hot tub.
- Beige hallway walls to reflect light from low wattage bulbs.
- Low-flow shower heads.

Distribution of Energy Costs by Area for a Medium-Sized Hotel



PREVENTIVE MAINTENANCE

Knowing that equipment works more efficiently and saves energy when properly maintained, Meyers organized a preventive maintenance program. Under the program, all the motel equipment is cleaned, lubricated, and tuned on a regular basis, rather than waiting until it breaks down. The fins on each room air conditioner, for example, are cleaned and straightened at the end of each cooling season.

In addition to cutting energy costs, he said, the preventive maintenance program keeps the motel running smoothly, makes the equipment last longer, keeps repair costs down, and protects his investment.

"Daily maintenance is important," he said. "If you don't stay with it, all of a sudden you've got a beat-up property."

Meyers said he constantly looks for ways to keep his utility bills down.

As part of that effort, he had Robert E. Aulbach do a walk-through energy audit of the Thrifty Scot in May 1984.

Aulbach is president of RoBach Inc. in Torrance, California, and a consultant for Ramada Inns and Hilton Hotels and has served Sheraton Hotels, Holiday Inns, and independent hotels all over the world. He wrote "Energy Conservation," a 238-page book published by the American Hotel and Motel Association.

free from
MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
DNRC
Energy Division
Capitol Station
Helena, MT 59620

THE AUDIT

First Aulbach analyzed the Thrifty Scot's natural gas and electricity bills for the preceding year. Then he spent three hours touring the motel and talking to Meyers and the motel staff. A thorough inspection and report would have involved more time and expense, he explained.

A thorough audit, Aulbach added, would be advisable if you are doing extensive remodeling, buying expensive equipment, building additions, or putting up new motels.

SPECIFIC ACTIONS

Before the audit, Meyers said, "Any time we found something to do that would save energy, we did it. But the audit gave me some things I could really sink my teeth into."

Meyers was so pleased with the new water heater that he gradually implemented Aulbach's other recommendations.

"We couldn't do everything at once," he explained. "But as our cash flow allowed, we made the energy-saving improvements."

FLUORESCENT LIGHTS

In November 1984 Meyers replaced 17 incandescent corridor lamps with fluorescent lamps. The 17 lamps and six replacement bulbs cost $440. Aulbach estimated the fluorescent lamps would save 20 to 30 percent of the $887 per year it cost to keep the incandescent corridor lamps lit.

"In addition to saving electricity," Meyers said, "the fluorescent bulbs don't burn out as often as incandescent bulbs, and that saves us time and labor".

Aulbach said fluorescent bulbs usually last eight to ten times longer than incandescent bulbs.

OUTSIDE RESET CONTROL

The motel is heated with a central, gas-fired, hydronic boiler. Aulbach recommended an outside reset control to synchronize the temperature of the water in the space-heating boiler with the outdoor temperature. Before the control system was installed in May 1985, the boiler kept the water at 190 degrees. However, when the outdoor temperature is 50 degrees, 100-degree water will keep the motel rooms comfortable. That means the natural gas used to raise the water temperature from 100 to 190 degrees was wasted. With the reset control, the water circulates at 100 degrees when the outside temperature is 50, but at 210 degrees when outdoor temperatures are below zero.

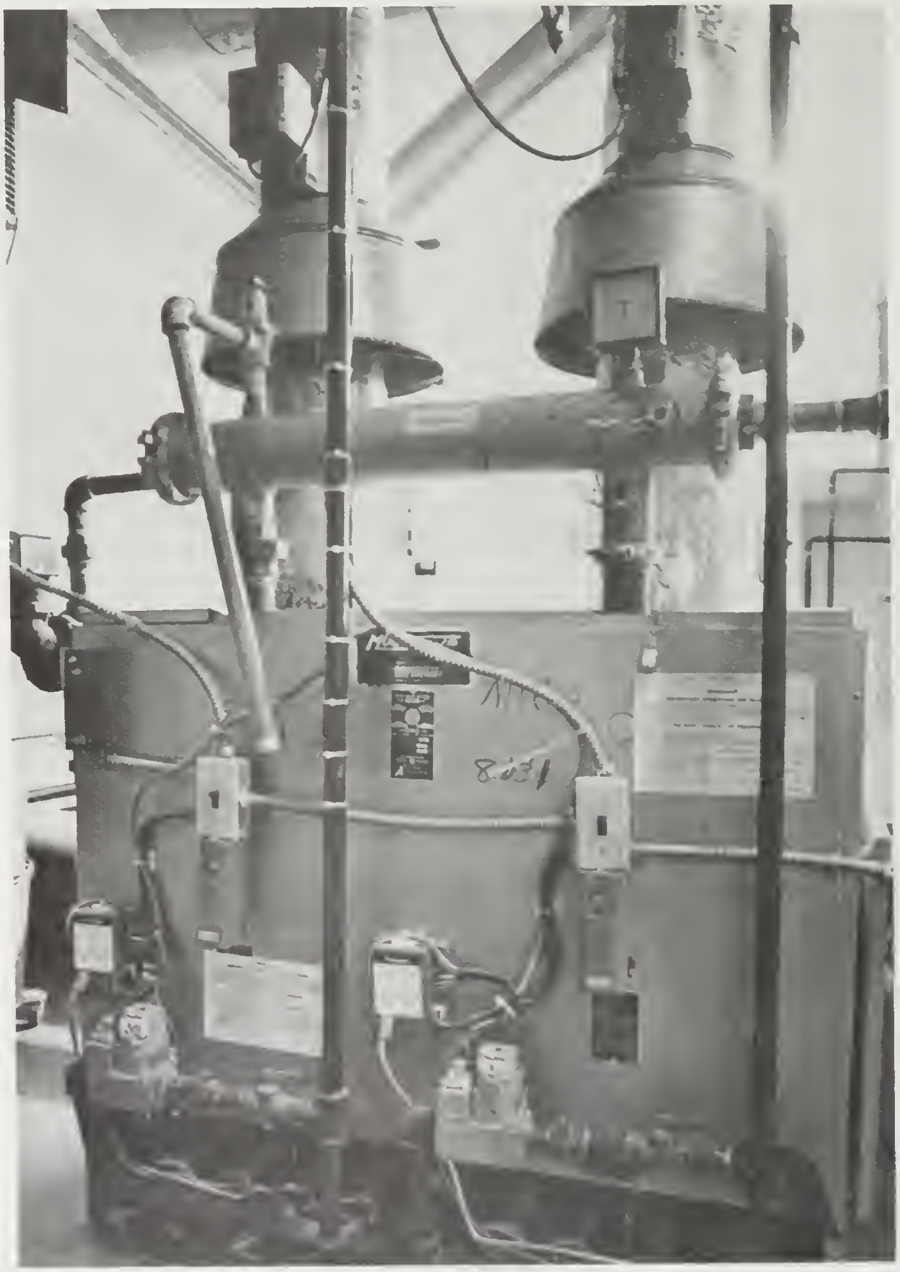
DEADBAND THERMOSTAT

Meyers also installed a deadband thermostat. Without the deadband thermostat, the boiler fired up every time the water temperature dropped even one deree to 189. The constant turning on and off (short cycling) was hard on the boiler and used lots of natural gas. The deadband thermostat lets the water temperature drop 20 degrees before the boiler fires up again.

OTHER FURNACE MODIFICATIONS

At the same time, Meyers made several other modifications to the boiler, including:

- Replacing the standing pilot light with an electronic ignition system.
- Staging the boiler so the burner comes on in sections rather than all at once. Before the boiler was staged, the entire boiler fired up even when only a little heat was needed.
- Adding dampers that close automatically when the boiler isn't running to prevent heat from escaping up the flue.



The outside reset control on Thrifty Scot's boiler synchronizes the temperature of the water in the boiler with the outdoor temperature.

- Installing lockouts on the boiler and the circulating pump so they won't work when the outside temperature is above 60 degrees. This keeps the boiler from coming on when the temperature in one room drops below 65 degrees for a few minutes on a warm spring day.

The furnace modifications cost $2,500. Meyers said he expects the furnace modifications to cut his natural gas bills for space heating 20 to 25 percent.

Charlie Sprague installs an air conditioner cover.

ENERGY-SAVING WORKSHOP

Meyers and Charles Sprague, resident manager of the Thrifty Scot, attended one of Aulbach's day-long workshops on energy conservation in hotels and motels.

"I was aware of the need for energy conservation," Meyers said, "but the workshop renewed my interest and gave me some direction. I know Charlie learned a lot from the workshop. Now that he's aware of energy use, he's made several improvements in the motel." One of those improvements was putting covers over the room air conditioners in the winter to keep cold air out.

Meyers concluded that time and money invested in energy conservation are worth it.

"We're always looking for places where we can get better performance out of the motel," he said. "We want to plug any leaks where we lose money. The audit really got us headed in the right direction as far as energy is concerned."

Imagine what large operators can do.

These fluorescent hallway lights save Thrifty Scot $175-250 a year on electricity.

FOR MORE INFORMATION

- Your local utility company is an excellent source of information about energy conservation.

- The Montana Innkeepers Association, Box 851, Helena, MT 59624, has information on energy conservation.

- The Montana Department of Natural Resources and Conservation, 32 South Ewing, Helena, MT 59620, offers a free booklet, "How to Reduce Energy Costs in Your Building."

- The Consulting Engineers Council of Montana, P.O. Box 2128, Great Falls, MT 59403, offers a free booklet, "Energy Management: A Wise Investment?"

- The American Hotel and Motel Association Technical Services Center, 888 Seventh Avenue, New York, NY 10106, offers technical information about hotel and motel operations, including energy and water conservation. The center's publications include an annual survey of energy and water use in 350 properties across the country and a maintenance and energy conservation desk manual.

- "Working with Consultants" is available for $4.00 from the Montana Department of Commerce, Community Development Division, Capitol Station, Helena, MT 59620. This 1984 publication offers advice on finding, selecting, hiring, and monitoring the work of consultants.

- American Institute of Architects, 1629 Avenue D, Box 20996, Billings, MT 59104.

- Montana Contractors Association, Inc., 1717 Eleventh Avenue, Box 4519, Helena, MT 59604.

- Montana Society of Engineers, 1629 Avenue D, Box 20996, Billings, MT 59104.

- National Electrical Contractor Association, 2030 Eleventh Avenue, Helena, MT 59601.

- Sheet Metal Contractors Association, 2030 Eleventh Avenue, Helena, MT 59601.

•• The graphs in this publication were reproduced with permission from "Energy Management" by Robert E. Aulbach. Copyright 1984 by the Educational Institute of the American Hotel & Motel Association, 1407 South Harrison Road, East Lansing, Michigan 48823. The 238-page book costs $38.45.

START SAVING ENERGY ON YOUR PROPERTY TODAY

Energy Consultant Robert E. Aulbach offered these ten tips for saving energy in your property.

1. **Set up an energy committee.**

   Be sure every department is represented, not just the maintenance department. There are energy-saving opportunities in every department—food and beverage, housekeeping, and the front desk.

2. **Write an operations manual.**

   Just a single page for each piece of equipment in your property is enough; it should explain exactly how to operate and maintain the equipment. The operations manual is especially helpful when you have changes in personnel.

3. **Have an energy audit.**

   Some utilities offer free walk-through audits. Many Montana consulting firms do in-depth audits. The auditor will help you draw up an energy strategy, including identifying which actions will give you the best return on your investment.

4. **Keep a record of your energy consumption.**

   Learn to read your gas, electricity, and water meters. Read them on the first of the month so you can compare your energy use with your occupancy data. Your utility company representative can explain your bill and show you how to read the meter.

5. **Hold an energy workshop for your staff.**

   Just letting everyone on the property know you care about energy conservation will help. Your staff has good ideas for saving energy. Just ask them.

6. **Set up a preventive maintenance program.**

   A formal, documented program will ensure that all equipment gets the maintenance it needs. A formal preventive maintenance program starts with a list of all equipment that should be maintained and when it should be cleaned, lubricated, and tuned. Record the date of maintenance done on each piece of equipment. Properly maintained equipment uses less energy than poorly maintained equipment. Regular preventive maintenance can also keep repair costs low, minimize equipment down time, and extend the life of your equipment.

7. **Turn it off.**

   Turn equipment off when it's not in use. The air-handling equipment in meeting rooms, for example, can be turned down or off when the rooms are empty.

8. **Set objectives.**

   Have a set of reasonable objectives for energy conservation, and let everyone on the property know what those objectives are.

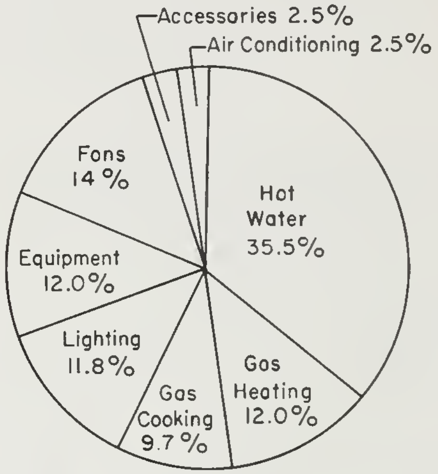
9. **Use life-cycle costing.**

   Select new equipment on the basis of the total cost of buying, running, and maintaining it over its expected life rather than on the basis of initial cost only.

10. **Understand the variables that affect energy consumption.**

    For example, when you turn off an air supply fan, turn off the accompanying exhaust fan to keep the building in balance.

Hotel Energy Consumption by Use••



The 24,750-square-foot Thrifty Scot Motel is on Highway 93 South in Kalispell.

1,500 copies of this public document were published at an estimated cost of 24¢ per copy, for a total cost of $360.00, which includes $360.00 for printing and $.00 for distribution.

This publication was funded by the Bonneville Power Administration.